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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,670	06/24/2005	Chin Chang	US020636	2905

24737 7590 06/12/2008
PHILIPS INTELLECTUAL PROPERTY & STANDARDS
P.O. BOX 3001
BRIARCLIFF MANOR, NY 10510

EXAMINER	
RAINEY, ROBERT R	

ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
06/12/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,670	CHANG, CHIN	
	Examiner	Art Unit	
	ROBERT R. RAINEY	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 March 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. The amendments to Figures 5-8 effectively overcome the objections to these drawings.

2. The amendments to the claims effectively overcome the objections to the claims.

3. Applicant's arguments filed 3/28/2008 concerning claim 2 and claims 11 and 19 that now include the limitations of claim 2 and the claims dependent from newly independent claim 2 as well as independent claims 11 and 19 have been fully considered but they are not persuasive. Applicant argues that KAMIKAWA et al. discloses a phenomenon in which the wavelength of the LED increases with temperature but does not disclose determining first and second color coordinate sets and specifically that the sections cited in the rejection do not disclose "determining" anything and that the control taught does not discuss temperature, CCT shifting, or modulation of a current signal in relation based on determining color coordinate sets. Examiner disagrees. In the first cited section, 1:42-48, the "red shift phenomenon", that is the change in wavelength, that is a CCT shift, of the LED with temperature, is taught as a phenomenon that causes the prior art driving methods to be inadequate. Also in this first citation the prior art driving method is said to comprise driving "... using two parameters (peak value and average power) of a driving current pulse". This seemed adequate to the Examiner to indicate that the disclosed modulation method would also involve current modulation. The rest of the specification confirms that the modulation is a current modulation scheme. The second cited section, 5:1-3, lists a benefit of the

disclosed driving method over the prior art in that "variation of the emission intensity and light color of the LED device can be suppressed". If one is going to suppress a variation, that is the change in wavelength, i.e. CCT shift, with temperature, one must determine what this variation is and "determination" is taught. Thus all limitations are taught and the rejection is maintained.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claims 2-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,717,355 to *Takahashi et al.* ("*Takahashi*") in view of U.S. Patent No. 6,628,249 to *Kamikawa et al.* ("*Kamikawa*").

As to **claim 2**, *Takahashi* discloses a method to provide color temperature correction in emission spectra of a phosphor converted LED (see for example column 3 line 56 to column 4 line 20 or Fig. 1 and column 8 line 66 to column 9 line 1 noting that "fluorescent material", i.e. item number 36, is an alternate expression for "phosphor") under PWM current drive comprising (see for example column 6 lines 31-32 "driven by a pulse current"): determining a modulation for a driving current signal (see for example column 6 lines 20-32

noting that in order for the color tone to be "adjusted delicately" by the "time sharing" the time sharing modulation must first be determined); modulating a constant magnitude current signal based on the determined modulation (see for example column 6 lines 20-32 noting that the modulation is based on time that "a pulse current" is applied); and applying the modulated current signal to cause a color temperature correction in the emission spectra of the LED (see for example column 6 lines 20-32 noting that adjusting the "color tone" is equivalent to "color temperature correction").

Takahashi does not expressly disclose that determining a modulation includes determining a first LED emission spectra color coordinate set and a second LED emission spectra color coordinate set wherein the first color coordinate set represents LED emission spectra at a first LED operational temperature and the second color coordinate set represents a CCT shift in the LED emission spectra due to operation of the LED at a second operational temperature.

Kamikawa discloses a method for driving a light emitting apparatus and in particular: that determining a modulation includes determining a first LED emission spectra color coordinate set and a second LED emission spectra color coordinate set wherein the first color coordinate set represents LED emission spectra at a first LED operational temperature (see for example column 1 lines 42-48, with the un-increased temperature being the first temperature and the un-red-shifted spectrum being the first coordinate set) and the second color

coordinate set represents a CCT shift in the LED emission spectra due to operation of the LED at a second operational temperature (see for example column 1 lines 42-48, with the increased temperature being the second temperature and the red-shifted spectrum being the second coordinate set) (further see column 5 lines 1-3, which teach suppression of variation in light color). Also, for a more detailed mapping see the response to arguments section above (paragraph numbered "3"). Said response is incorporated here by reference.

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to use the method of *Takahashi* to control the effects of color change with temperature as taught by *Kamikawa*. The suggestion/motivation would have been to provide advantages such as to suppress variation of the light color (see for example *Kamikawa* column 4 line 62 to column 5 line 3).

As to **claim 3**, in addition to the rejection of claim 2 over *Takahashi* and *Kamikawa*, *Kamikawa* further discloses that applying the determined current signal modulation to the LED causes the LED emission spectra at the first color coordinate set (see for example column 1 lines 42-48, with the un-increased

temperature being the first temperature and the un-red-shifted spectrum being the first coordinate set) to be substantially constant as the LED operational temperature changes from the first LED operational temperature to the second LED operational temperature (see for example column 1 lines 42-48, with the increased temperature being the second temperature, and further see column 5 lines 1-3, which teach suppression of variation in light color).

Arguments for analogous art, obviousness and suggestion/motivation are the same as for the parent claim.

As to **claim 4**, in addition to the rejection of claim 2 over *Takahashi* and *Kamikawa*, *Kamikawa* further discloses modulation that includes changing frequency of the current signal (see for example column 11 lines 1-2, especially "changing the number of pulses in a predetermined time").

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to use variable frequency PWM as taught by *Kamikawa* with the method of *Takahashi*. The suggestion/motivation would have been to provide advantages such as to separately control the emission wavelength and emission power (see for example *Kamikawa* column 1 lines 51-52).

As to **claim 5**, in addition to the rejection of claim 2 over *Takahashi* and *Kamikawa*, *Takahashi* further discloses modulation that includes changing the current signal pulse width (see for example column 6 lines 18-32 noting that for a given persistence of the fluorescence, adjusting the "time sharing" of the direct and fluorescent emissions involves a change in the on time of the LED, i.e. a change in the pulse width).

Kamikawa further discloses that the duty (i.e. duty-cycle) is set to a value corresponding to an emission intensity of the LED (see for example column 4 lines 9-10) and that duty-cycle may be changed either by changing the pulse-width and holding the frequency constant or changing the frequency and holding the pulse-width constant (see for example column 10 lines 64-67).

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to use variable duty cycle PWM as taught by *Kamikawa* with the method of *Takahashi*. The suggestion/motivation would have been to provide advantages such as to separately control the emission wavelength and emission power (see for example *Kamikawa* column 1 lines 51-52).

As to **claim 6**, in addition to the rejection of claim 5 over *Takahashi* and *Kamikawa*:

Kamikawa further discloses that the total light output of the LED is changed responsive to the changing of the current signal duty cycle (see for example column 4 lines 9-10).

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to use variable duty cycle PWM as taught by *Kamikawa* with the method of *Takahashi*. The suggestion/motivation would have been to provide advantages such as to separately control the emission wavelength and emission power (see for example *Kamikawa* column 1 lines 51-52).

As to **claim 7**, in addition to the rejection of claim 5 over *Takahashi* and *Kamikawa*:

Takahashi further discloses (to restate the conclusion of the arguments of the rejection of claim 1) changing the color of the LED by changing the pulse-width of the current pulse with respect to the persistence of the fluorescence or alternately stated *Takahashi* discloses keeping the pulse-width constant in order to maintain a desired color (see for example *Takahashi* column 6 lines 18-32 and the rejection of claim 1 for further details)

Kamikawa further discloses that the duty (i.e. duty-cycle) is set to a value corresponding to an emission intensity of the LED (see for example column 4

lines 9-10) and that duty-cycle may be changed either by changing the pulse-width and holding the frequency constant or changing the frequency and holding the pulse-width constant (see for example column 10 lines 64-67).

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to set the pulse width for a given desired color according to the method of *Takahashi*, while achieving a desired total light output of the LED, i.e. constant, by setting the duty-cycle as taught by *Kamikawa* and to achieve the desired duty-cycle for a given pulse-width by varying the current signal frequency as further taught by *Kamikawa*. The suggestion/motivation would have been to provide advantages such as to separately control the emission wavelength and emission power (see for example *Kamikawa* column 1 lines 51-52).

As to **claim 8**, in addition to the rejection of claim 2 over *Takahashi* and *Kamikawa, Takahashi* further discloses that applying the modulated current signal comprises selectively coupling a power supply to the LED based on the determined modulation (see for example column 6 lines 31-32 "driven by a pulse current", which would not occur unless the power supply were selectively coupled to the LED).

As to **claim 9**, in addition to the rejection of claim 8 over *Takahashi* and *Kamikawa*, *Takahashi* further discloses that the LED is a phosphor converted white light LED (see for example column 6 line 29 "white light").

As to **claim 10**, in addition to the rejection of claim 9 over *Takahashi* and *Kamikawa*, *Takahashi* discloses (to restate the conclusion of the arguments of the rejection of claim 1) changing the color of the LED by changing the pulse-width of the current pulse with respect to the persistence of the fluorescence (see for example *Takahashi* column 6 lines 18-32 and the rejection of claim 1 for further details)

Takahashi does not expressly disclose that the LED junction emission intensity is substantially constant while the phosphor emission intensity is increased responsive to the current signal modulation.

Kamikawa discloses that the duty (i.e. duty-cycle) is set to a value corresponding to an emission intensity of the LED (see for example column 4 lines 9-10) and that duty-cycle may be changed either by changing the pulse-width and holding the frequency constant or changing the frequency and holding the pulse-width constant (see for example column 10 lines 64-67).

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to determine the pulse width required for a desired color, i.e. one with relatively more fluorescent emission versus junction emission than a given color, according to the method of *Takahashi* and to achieve a desired brightness, i.e. one corresponding to constant total junction emission, by adjusting the frequency such that the duty-cycle of the current pulse and junction emission remain constant, i.e. by increasing the frequency as taught by *Kamikawa* since the color change required a decrease in the pulse width. The suggestion/motivation would have been to provide advantages such as to separately control the emission wavelength and emission power (see for example *Kamikawa* column 1 lines 51-52).

Claim 11 claims the structure implicit in the method claimed in claim 2 and is rejected on the same grounds and arguments as claim 2.

As to **claim 12**, in addition to the rejection of claim 11 over *Takahashi* and *Kamikawa*, *Takahashi* further discloses that the modulation includes changing the constant-current magnitude signal pulse width (see for example column 6 lines 18-32 noting that for a given persistence of the fluorescence, adjusting the "time sharing" of the direct and fluorescent emissions involves a change in the on time of the LED, i.e. a change in the pulse width).

Takahashi does not expressly disclose that the color correction control circuit includes pulse width modulator circuit having configurable frequency and duty cycle.

Kamikawa discloses that disclose that the control circuit includes a constant-current magnitude pulse width modulator circuit having configurable frequency (see for example column 11 lines 1-2, especially "changing the number of pulses in a predetermined time") and duty cycle (see for example column 4 lines 9-10).

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to use a pulse width modulator circuit having configurable frequency and duty cycle as taught by *Kamikawa* with the apparatus after *Takahashi*. The suggestion/motivation would have been to provide advantages such as to separately control the emission wavelength and emission power (see for example *Kamikawa* column 1 lines 51-52).

As to **claim 13**, in addition to the rejection of claim 12 over *Takahashi* and *Kamikawa*, *Takahashi* further discloses that the control circuit includes a power supply selectively arranged to deliver power to the pulse width modulator circuit. (see for example column 6 lines 31-32 "driven by a pulse current", which would

not occur unless the power supply were coupled to the pulse width modulator circuit).

Arguments for analogous art, obviousness and suggestion/motivation are the same as for the parent claim.

As to **claim 14**, in addition to the rejection of claim 11 over *Takahashi* and *Kamikawa*, *Kamikawa* further discloses that the control circuit includes a processor control system (see for example Fig. 1 item 101 "CALCULATION PROCESSOR").

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to include a processor control system in the control circuit as taught by *Kamikawa* with the apparatus after *Takahashi*. The suggestion/motivation would have been to provide advantages such as to calculate and output a duty signal (see for example *Kamikawa* column 7 lines 14-15).

As to **claim 15**, in addition to the rejection of claim 14 over *Takahashi* and *Kamikawa*:

Takahashi as represented in the rejection of claim 11, which is the apparatus implied by the method of claim 1, describes the steps claimed in claim 15, i.e. determining a modulation for an LED driving current signal; modulating a constant magnitude current signal based on the determined modulation; and applying the modulated current signal to the LED to cause a color temperature correction in the emission spectra of the LED.

Kamikawa as covered in the rejection of claim 14 discloses the assignment of various such functions to a processor control system.

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to includes a processor control system in the control circuit as taught by *Kamikawa* with the apparatus after *Takahashi* and further to assign to the processor control system the claimed steps. The suggestion/motivation would have been to provide advantages such as to calculate and output a duty signal (see for example *Kamikawa* column 7 lines 14-15) or to avoid duplicating resources by assigning some functions to one control element and others to another element.

As to **claim 16**, in addition to the rejection of claim 15 over *Takahashi* and *Kamikawa*:

Kamikawa further discloses that applying the determined current signal modulation to the LED causes the LED emission spectra at the first color coordinate set (see for example column 1 lines 42-48, with the un-increased temperature being the first temperature and the un-red-shifted spectrum being the first coordinate set) to be substantially constant as the LED operational temperature changes from the first LED operational temperature to the second LED operational temperature (see for example column 1 lines 42-48, with the increased temperature being the second temperature, and further see column 5 lines 1-3, which teach suppression of variation in light color).

Takahashi and *Kamikawa* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single color LEDs with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to use the method of *Takahashi* to control the effects of color change with temperature as taught by *Kamikawa*. The suggestion/motivation would have been to provide advantages such as to suppress variation of the light color (see for example *Kamikawa* column 4 line 62 to column 5 line 3).

As to **claim 17**, in addition to the rejection of claim 11 *Takahashi* and *Kamikawa, Takahashi* further discloses that the LED is a white light phosphor converted LED (see for example column 6 line 29 “white light”).

As to **claim 18**, in addition to the rejection of claim 15 over *Takahashi* and *Kamikawa*:

Takahashi further discloses that the LED is an InGaN phosphor converted white-light LED (see for example column 6 line 29 "white light" and column 4 line 13 "Ga...In...N").

Kamikawa further discloses that the LED is an InGaN phosphor converted white-light LED (see for example column 15 lines 54-57 "white" and column 6 line 31 "InGaN").

Arguments for analogous art, obviousness and suggestion/motivation are the same as for the parent claim.

Claim 19 claims the structure implicit in the method claimed in claim 2 and is rejected on the same grounds and arguments as claim 2.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT R. RAINEY whose telephone number is (571)270-3313. The examiner can normally be reached on Monday through Friday 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amare Mengistu can be reached on (571) 272-7674. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RR/

/Amare Mengistu/

Supervisory Patent Examiner, Art Unit 2629